

# **TOUSSAINT RIVER DREDGING WITH ORDNANCE CONTAMINATION**

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**INTRODUCTION.** On September 25, 1991, while doing a maintenance dredging operation at the mouth of the Toussaint River, a live 106mm High Explosive Anti Tank (HEAT) round was discovered stuck in the cutterhead of the dredge and it was removed by hand. Picture in your mind this contractor wedging a crowbar between the cutterhead and the live round trying to dislodge it. Luckily the round did not explode, but the routine maintenance project came to an abrupt end.

**HISTORY.** The Toussaint River is adjacent to the former Erie Army Depot, active from 1918 to September 1965. One of the depot's missions was to proof test artillery ammunition. This was accomplished by firing at targets on or near the beach and out into Lake Erie. Over the years large amounts of ammunition, both live and inert, have been washing up onto the shore. This has contaminated the shallow waters off the beach (some getting caught in fishermen's nets), and some ending up in the Toussaint River channel. In July of 1991, the Former Erie Army Depot was declared eligible for cleanup under the Defense Environmental Restoration Program-Formerly Used Defense Site (DERP-FUDS). In the fall of 1992 an Interim Removal Action (IRA) was conducted by Explosives Ordnance Disposal Technology (EODT). They removed and disposed of approximately 5,000 rounds of various ammunition items (60mm to 165mm) from a three mile long by 500 feet wide beach front. A Revised Inventory Project Report (INPR) was written in June 1994 to include the Toussaint River and Dredge Disposal Area as eligible for cleanup under DERP-FUDS. Preparation for an Engineering Evaluation/Cost Analysis (EE/CA) to study the cleanup of ordnance contamination at former Erie Army Depot started. The EE/CA was terminated on November 24, 1994 because rights-of-entry were not given from the current owners. On July 10, 1995, after considerable delay due to equipment and logistic problems, the Toussaint River Dredging Demonstration began. The purpose of the dredging demonstration was to evaluate the effectiveness of a clamshell dredge bucket, utilizing additional engineering and safety controls, in removing channel sediment containing ordnance, separating the sediments from the ordnance, and disposing of dredged sediments. Shoreline Contractors, Inc. was contracted by Buffalo District, Corps of Engineers, to remove the sediments over the entire length of the Toussaint River channel (approximately 2,100 x 150 feet). Human Factors Applications, Inc. (HFA) was contracted by the U.S. Army Corps of Engineers, Huntsville Center of Expertise for Ordnance and Explosives, to perform Unexploded Ordnance (UXO) support for the project. All personnel from the HFA field unit have prior explosive ordnance disposal (EOD) training and experience. Shoreline Contractors developed a system using a clamshell dredge to remove sediments from the channel. The dredged material was sifted through screens to segregate any items of ordnance. Once ordnance was located on the screens, HFA personnel removed it to an Ordnance Disposal Area. The dredging contractor then disposed of the sediments in the Dredge Disposal Area.

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**ORDNANCE DISPOSAL AREA.** An area 1,500 feet north of the Toussaint River, on Toledo Edison property, was used as the demolition site. This site was visually inspected, searched with a magnetometer and deemed appropriate for disposal operations.

**SAFETY ZONE.** The safety zone for the demonstration was within a 1,250' radius of the dredging barge. It was deemed to be active only during the dredging and washing operations and at such times that UXO was present on the screens. During dredging periods, all vessel traffic was prohibited from entering the safety zone. All operation personnel were restricted to blast protected areas (a minimum of 52 feet from the clamshell bucket and screens).

**NAVIGATIONAL RESTRICTIONS.** Approximately 30 days before project start, a notice to mariners was mailed to the U.S. Coast Guard in Cleveland, Ohio, local government agencies, all yacht clubs and marinas in the area and ILYA (Interlake Yachting Association) member clubs. The notice informed them of the area of the upcoming project, the established safety zone, the hours that the channel would be closed for dredging, and the times that the channel would be open for vessel traffic. At the start of the project, a 4' x 6' sign was posted near the channel mouth, clearly visible to boater traffic, with the following information: **"Attention Boaters! Monday through Friday, 8:15 a.m. to 6:00 p.m., the entrance channel will be closed to vessel traffic from fifteen minutes past the hour until the top of the hour for dredging. All vessels must remain 1.250' away from the dredge during these periods. The channel will be open from the top of the hour until fifteen minutes past the hour. Please proceed with caution past the dredge at this time. Thank you for your cooperation."** A similar sign was installed on a driven pile near the outer limit of the navigation channel to warn vessels approaching from the lake. The piling was lighted at night and removed at the completion of the project.

At the start of dredging each day, two warning buoys were placed at each end of the 1.250' safety zone. These were relocated as the dredge was moved to maintain the limits of the zone. At the end of dredging each day, they were removed.

During dredging operations, traffic control vessels were used to deter vessels that would otherwise enter the active safety zone. The boats were equipped with the appropriate radio band channels. They were also equipped with a hailing device to warn boaters.

Approaching boaters were verbally warned to stay clear of the safety zone. However, no enforcement authority was implied and no attempts to physically restrain violators were made. Dredging operations continued and such violators proceeded at their own risk.

In the event that such traffic was not present, the dredging operation continued. While scows were being exchanged, dredging and washing of sediment through the screens was suspended. However, the safety zone was deemed to be active and vessel traffic (other than the contractor's) were not allowed into it. When ordnance was detected, the safety zone was considered active. No traffic (other than that of the UXO personnel) was permitted until the ordnance was properly disposed of. If this period overlapped the fifteen minute vessel passage window, a short period was allowed for awaiting vessel traffic to pass before resuming dredging operations.

**EQUIPMENT.** The crane barge used in this demonstration was set up with a crawler crane secured in the middle of the deck; able to swing a three cubic yard clamshell bucket left and right. Behind the crane an office trailer was placed with a window facing forward so that dredging operations could be observed from within. Video recording and monitoring equipment were installed inside the trailer. Controls for remote operation of the video camera were located near the video monitor. A pump station consisting of a 6" high pressure, high volume type, diesel powered pump was installed on the port side of the barge. It had a manifold to allow discharge to either a fixed spray system within the dump scow or a monitor (water cannon) located near the pump, which was located a minimum of 52' from the hopper. The fixed spray system was controlled by a valve at the operator's station. The locally operated monitor system was controlled independently of the fixed spray system. The crane, pump station, and trailer were fitted with 1/4" thick steel armor plating. Two laminated sheets of Lexan Lexgard SP-1250 were installed at viewing locations for blast protection. A diesel driven generator was installed to provide 110V AC power for the trailer and video equipment. A video camera was mounted on a 15' pole located above and near the pump station so that dredging from the starboard side could be conducted without risking damage to the camera. The original screens used were too small (3/4" openings) for dredged material to pass through. The screens became clogged with rocks and sea shells. These screens were modified by cutting every other grate, increasing the size of the openings to 1 1/2". These proved sufficient until the weight of the sediment caused the screens to bend and sag downward. This caused a gap between screens allowing large chunks of sediment, and possibly ordnance, to fall into the bottom of the scow. These screens were replaced with 2" x 2" x 1/4" diameter stock screens (space cloth). These screens proved more workable as for clogging. However, after time, the screens began to sag, which caused pockets to develop where the spray from the high pressure water hose could not hit the sediment. This could be alleviated by either using better (stronger) screens, or by elevating the high pressure hose so that the spray could hit the sediment from above. I recommended a monitor system be devised to aim the spray from a remote control station inside the trailer, releasing one operator on deck.

**DREDGING OPERATION.** With the dredge set in position, a dump scow was tied off across the bow. The crane, with clamshell bucket, dredged off the starboard side of the barge. The arc of the bucket passed along the long axis of the hopper of the dump scow. Dredged sediment was distributed as evenly as possible over the screens by slowing releasing it through the arc over the hopper. The pump operator, using the monitor system, sprayed the sediment as it was being released onto the screens of the dump scow. This allowed the loose sediment to filter its way down through the screens into the bottom of the scow.

The dredged material on the screens was initially sprayed from underneath by means of an internal piping system to wash it through. This system was fed from the 6" pump through a 3" diameter pipe to a hydrant near the bow. Flexible hose connected the hydrant to the dump scow piping by quick disconnect couplers. Any material not washed through the screens by the fixed spray system would be sprayed by means of the monitor system.

The fixed spray system severely limited visibility, because water came through the screens and obliterated the view, therefore, the use of this system was stopped. While the fixed spray system may be applicable for some operations, it should not be used for ordnance operations.

During the entire dredging and washing operation, the screens were observed by UXO personnel by means of the remote controlled closed circuit TV camera. As backup to the monitor, further detailed observation was provided by one UXO person viewing through the Lexan window using binoculars. This helped distinguish UXO from debris.

Once the scow was filled, and no ordnance observed on the screens, miscellaneous material such as stones and sea shells remaining on the screens were emptied into the dump scow hopper. This was accomplished by the crane lifting the elevated side of the screen while the side closest to the dredge slid within a track until the screen was near vertical. Once the debris had fallen into the hopper, the screen was lowered back into its place on the frame.

At this point, the workboat "Falcon" would haul the dump scow to the Dredge Disposal Area for discharge of the dredged sediment. Meanwhile a second scow, previously tied off on the port side of the dredge would be repositioned off the bow. After the lines had been made fast, doors closed and screens checked, all personnel would vacate the open deck. Except the crane and pump operators, others would return to the office trailer, after which dredging would resume. After disposing of a load of dredged sediment, the Falcon and dump scow would remain outside the safety zone until the next scow was filled.

In the event that ordnance was observed on the video screen, the UXO personnel would alert the crane operator and the pump operator to cease operations. A flashing red beacon located beneath the closed circuit TV camera would be switched on by UXO personnel and remain on until the ordnance had been properly disposed of. This system was later modified to include a horn, because the light was not always seen by the operators. During this period, only UXO personnel would be allowed in the safety zone and all dredging and washing operations would cease. Operators would remain behind appropriate blast shields unless otherwise instructed by the UXO personnel. All vessels, including those of the contractor, would remain outside the safety zone unless specifically instructed by UXO personnel. Once all operations were stopped, the UXO Supervisor and one UXO Specialist would exit the trailer and investigate the item. If the item was ordnance, another specialist would bring a small boat to the dump scow. The ordnance would be removed from the screen and placed in the boat for transport to the Ordnance Disposal Area. The ordnance was sandbagged for transport. A diesel outboard engine was used on the small boat to reduce the possibility of fire. Once the small boat was 1,250 feet from the barge, the dredging operation would resume. When ordnance had been destroyed or judged harmless, UXO personnel would instruct operators to resume dredging.

The demonstration was completed on October 27, 1995. HFA located and destroyed six live UXO and removed 31 inert ordnance items. In addition, 568 pounds of scrap were recovered and turned over to a scrap dealer. The demonstration determined that dredging in areas contaminated with ordnance is feasible, provided the methods employed, and appropriate safety precautions taken, during this dredging demonstration are used and professional ordnance and explosives support is procured from the U.S. Army Engineering and Support Center, Huntsville.